

What is claimed is:

[Claim 1] An electrophoretic medium comprising an electrically charged particle suspended in a suspending fluid, the particle having a polymeric shell having repeating units derived from at least one monomer the homopolymer of which is incompatible with the suspending fluid.

[Claim 2] An electrophoretic medium according to claim 1 wherein the polymeric shell further comprises repeating units derived from at least one monomer the homopolymer of which is compatible with the suspending fluid.

[Claim 3] An electrophoretic medium according to claim 2 wherein the at least one monomer forming the compatible homopolymer comprises from about 15 to about 99 per cent by weight of the polymer shell.

[Claim 4] An electrophoretic medium according to claim 3 wherein the at least one monomer forming the compatible homopolymer comprises from about 50 to about 99 per cent by weight of the polymer shell.

[Claim 5] An electrophoretic medium according to claim 1 wherein the suspending fluid comprises a hydrocarbon.

[Claim 6] An electrophoretic medium according to claim 1 wherein the monomer forming the incompatible homopolymer comprises any one of more of acrylates and methacrylates formed from alcohols containing not more than about eight carbon atoms, said alcohols optionally containing hydroxyl or fluoro substituents; acrylamides and methacrylamides; N,N-dialkylacrylamides; N-vinylpyrrolidone; styrene and derivatives thereof; vinyl esters; vinyl halides; polyfluoroaromatic molecules containing a polymerizable functional group; and silicone-containing molecules containing a polymerizable functional group.

[Claim 7] An electrophoretic medium according to claim 6 wherein the monomer forming the incompatible homopolymer comprises any one of more of methyl methacrylate, ethyl methacrylate, butyl methacrylate, isobutyl methacrylate, t-butyl methacrylate, octyl methacrylate, 2-ethylhexyl

methacrylate, 2-hydroxyethyl methacrylate, trifluoroethyl methacrylate, 2,2,3,4,4,4-hexafluorobutyl acrylate, 2,2,3,4,4,4-hexafluorobutyl methacrylate, acrylamide, acrylic acid, acrylonitrile, methyl vinyl ketone, methacrylamide, N-vinylpyrrolidone, styrene, vinyl acetate, vinyl chloride, vinylidene chloride, and pentafluorostyrene.

[Claim 8] An electrophoretic medium according to claim 2 wherein the monomer forming the compatible homopolymer comprises lauryl methacrylate and the monomer forming the incompatible homopolymer comprises any one or more of styrene, t-butyl methacrylate and N-vinylpyrrolidone.

[Claim 9] An electrophoretic medium according to claim 1 further comprising a second type of electrically charged particle having at least one optical characteristic differing from that of the other electrically charged particle, the second type of electrically charged particle having a polymeric shell.

[Claim 10] An electrophoretic medium according to claim 9 wherein the electrically charged particle comprises titania and the second type of electrically charged particle comprises carbon black or copper chromite.

[Claim 11] An electrophoretic medium comprising:

- a suspending fluid;

- a first type of electrically charged particle suspended in the suspending fluid, the first type of particle having a first optical characteristic and a polymeric shell; and

- a second type of electrically charged particle suspended in the suspending fluid, the second type of particle having a second optical characteristic differing from the first optical characteristic, and a polymeric shell;

wherein the polymeric shells are arranged such that homoaggregation of the first and second types of particles is thermodynamically favored over heteroaggregation.

[Claim 12] An electrophoretic medium according to claim 11 wherein the polymeric shells of the first and second types of particles each comprise repeating units derived from at least one monomer the homopolymer of which is incompatible with the suspending fluid.

[Claim 13] An electrophoretic medium according to claim 12 wherein each polymeric shell further comprises repeating units derived from at least one monomer the homopolymer of which is compatible with the suspending fluid.

[Claim 14] An electrophoretic medium according to claim 13 wherein the at least one monomer forming the compatible homopolymer comprises from about 15 to about 99 per cent by weight of the polymer shell.

[Claim 15] An electrophoretic medium according to claim 14 wherein the at least one monomer forming the compatible homopolymer comprises from about 50 to about 99 per cent by weight of the polymer shell.

[Claim 16] An electrophoretic medium according to claim 11 wherein the suspending fluid has a dielectric constant less than about 5.

[Claim 17] An electrophoretic medium according to claim 11 wherein the suspending fluid comprises a hydrocarbon.

[Claim 18] An electrophoretic medium according to claim 17 wherein the suspending fluid comprises an aliphatic hydrocarbon.

[Claim 19] An electrophoretic medium according to claim 17 wherein the suspending fluid comprises an aryl-alkane or dodecylbenzene.

[Claim 20] An electrophoretic medium according to claim 12 wherein the monomer forming the incompatible homopolymer comprises any one of more of acrylates and methacrylates formed from alcohols containing not more than about eight carbon atoms, said alcohols optionally containing hydroxyl or fluoro substituents; acrylamides and methacrylamides; N,N-dialkylacrylamides; N-vinylpyrrolidone; styrene and derivatives thereof; vinyl esters; vinyl halides; polyfluoroaromatic molecules containing a polymerizable functional group;

and silicone-containing molecules containing a polymerizable functional group.

[Claim 21] An electrophoretic medium according to claim 20 wherein the monomer forming the incompatible homopolymer comprises any one of more of methyl methacrylate, ethyl methacrylate, butyl methacrylate, isobutyl methacrylate, t-butyl methacrylate, octyl methacrylate, 2-ethylhexyl methacrylate, 2-hydroxyethyl methacrylate, trifluoroethyl methacrylate, 2,2,3,4,4,4-hexafluorobutyl acrylate, 2,2,3,4,4,4-hexafluorobutyl methacrylate, acrylamide, acrylic acid, acrylonitrile, methyl vinyl ketone, methacrylamide, N-vinylpyrrolidone, styrene, vinyl acetate, vinyl chloride, vinylidene chloride, and pentafluorostyrene.

[Claim 22] An electrophoretic medium according to claim 13 wherein the monomer forming the compatible homopolymer comprises lauryl methacrylate and the monomer forming the incompatible homopolymer comprises any one or more of styrene, t-butyl methacrylate and N-vinylpyrrolidone.

[Claim 23] An electrophoretic medium according to claim 11 having an operating voltage threshold.

[Claim 24] An electrophoretic medium according to claim 11 wherein the suspending fluid and the particles are retained within a plurality of capsules or cells.

[Claim 25] An electrophoretic display comprising an electrophoretic medium according to claim 11 and at least one electrode disposed adjacent the electrophoretic medium and arranged to apply an electric field thereto.

[Claim 26] An electrophoretic particle comprising a pigment particle having a polymeric shell having repeating units derived from at least one monomer the homopolymer of which is incompatible with n-hexane.

[Claim 27] An electrophoretic particle according to claim 26 wherein the polymeric shell further comprises repeating units derived from at least one monomer the homopolymer of which is compatible with n-hexane.

[Claim 28] An electrophoretic particle according to claim 27 wherein the at least one monomer forming the compatible homopolymer comprises from about 15 to about 99 per cent by weight of the polymer shell.

[Claim 29] An electrophoretic particle according to claim 28 wherein the at least one monomer forming the compatible homopolymer comprises from about 50 to about 99 per cent by weight of the polymer shell.

[Claim 30] An electrophoretic particle according to claim 26 wherein the monomer forming the incompatible homopolymer comprises any one of more of acrylates and methacrylates formed from alcohols containing not more than about eight carbon atoms, said alcohols optionally containing hydroxyl or fluoro substituents; acrylamides and methacrylamides; N,N-dialkylacrylamides; N-vinylpyrrolidone; styrene and derivatives thereof; vinyl esters; vinyl halides; polyfluoroaromatic molecules containing a polymerizable functional group; and silicone-containing molecules containing a polymerizable functional group.

[Claim 31] An electrophoretic particle according to claim 26 wherein the monomer forming the incompatible homopolymer comprises any one of more of methyl methacrylate, ethyl methacrylate, butyl methacrylate, isobutyl methacrylate, t-butyl methacrylate, octyl methacrylate, 2-ethylhexyl methacrylate, 2-hydroxyethyl methacrylate, trifluoroethyl methacrylate, 2,2,3,4,4,4-hexafluorobutyl acrylate, 2,2,3,4,4,4-hexafluorobutyl methacrylate, acrylamide, acrylic acid, acrylonitrile, methyl vinyl ketone, methacrylamide, N-vinylpyrrolidone, styrene, vinyl acetate, vinyl chloride, vinylidene chloride, and pentafluorostyrene.

[Claim 32] An electrophoretic particle according to claim 27 wherein the monomer forming the compatible homopolymer comprises lauryl methacrylate and the monomer forming the incompatible homopolymer comprises any one or more of styrene, t-butyl methacrylate and N-vinylpyrrolidone.

[Claim 33] An electrophoretic particle according to claim 26 wherein the pigment particle comprises any one or more of titania, carbon black and copper chromite.

[Claim 34] An electrophoretic particle comprising a pigment particle having a polymeric shell having repeating units derived from at least one monomer the homopolymer of which is incompatible with perfluorodecalin.

[Claim 35] An electrophoretic particle comprising a pigment particle having a polymeric shell having repeating units derived from at least one monomer the homopolymer of which is incompatible with polydimethylsiloxane 200, viscosity 0.65 centistokes.

[Claim 36] An active matrix electro-optic display comprising:
a layer of electro-optic medium; and
a plurality of pixel electrodes disposed adjacent the layer of electro-optic medium and arranged to apply an electric field thereto,
wherein the electro-optic medium exhibits a voltage threshold.

[Claim 37] An electro-optic display according to claim 36 further comprising a capacitor associated with each pixel electrode.

[Claim 38] An electro-optic display according to claim 36 wherein the electro-optic medium comprises a plurality of charged particles suspended in a suspending fluid and capable of moving therethrough on application of an electric field to the electro-optic medium.

[Claim 39] An electro-optic display according to claim 38 wherein the charged particles have polymeric shells having repeating units derived from at least one monomer the homopolymer of which is incompatible with the suspending fluid.

[Claim 40] An electro-optic display according to claim 38 wherein the electro-optic medium comprises:

a first type of electrically charged particle suspended in the suspending fluid, the first type of particle having a first optical characteristic and a polymeric shell; and

a second type of electrically charged particle suspended in the suspending fluid, the second type of particle having a second optical characteristic differing from the first optical characteristic, and a polymeric shell;

wherein the polymeric shells are arranged such that homoaggregation of the first and second types of particles is thermodynamically favored over heteroaggregation.

[Claim 41] A process for producing a polymer-coated pigment particle, this process comprising:

(a) reacting the pigment particle with a reagent having a functional group capable of reacting with, and bonding to, the particle, and also having a polymerizable or polymerization-initiating group, thereby causing the functional group to react with the particle surface and attach the polymerizable group thereto; and

(b) reacting the product of step (a) with at least one monomer or oligomer under conditions effective to cause reaction between the polymerizable or polymerization-initiating group on the particle and the at least one monomer or oligomer, thereby causing the formation of polymer bonded to the pigment particle,

wherein step (b) is carried out in an aliphatic hydrocarbon.